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THE COMMON LIVER FLUKE IN SHEEP

U.S. DEPARTMENT OF AGRICULTURE

THE COMMON LIVER FLUKE IN SHEEP

The common liver fluke is a parasitic worm that infects the livers of sheep, goats, cattle, wild rabbits, and, occasionally, deer and other warmblooded animals.[1] It must develop in a fresh-water snail before it gets into the animal's body.

When heavy infections occur, the parasite causes profuse bleeding in the liver where it damages or destroys tissues. Frequently, sheep die from flukes. In addition to losses from animal deaths, United States sheepmen lose about $1 million annually from the condemnation of fluky livers. Under Federal meat inspection laws, damaged livers are condemned as unfit for human food.

The common liver fluke is most prevalent in sheep in the Western States, in Texas, Arkansas, Louisiana, Florida, Alabama, Michigan, Missouri, and Wisconsin.

Conditions in many fluke-free areas seem favorable to the development of the parasite. Every section of the United States has at least one species of snail in which flukes can develop. This widespread distribution of suitable snails may lead to future spread of liver flukes to all 50 States.

If sheep are treated regularly for flukes, they can be profitably raised in many fluky areas.

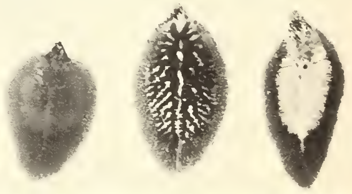
HOW SHEEP GET FLUKES

Before it can infect a warmblooded animal, the common liver fluke must develop in the body of its intermediate host—a fresh-water snail. Seven of the species of fresh-water snails that occur in the continental United States, and one fresh-water snail that occurs in Hawaii, are suitable hosts.

These long-lived snails live in wet-weather springs, in slow-moving fresh water, in stagnant water, on swampy and marshy lands, on the banks of ponds, streams, and ditches, and in mud. Several species survive in high altitudes.

When it has completed its development in the snail, the fluke forms a tiny cyst on grass or on water. Sheep become infected with flukes when they eat grass or drink water containing these cysts.

Sheep cannot become infected by contact with fluky sheep or other animals.



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Common liver flukes (stained, natural size).

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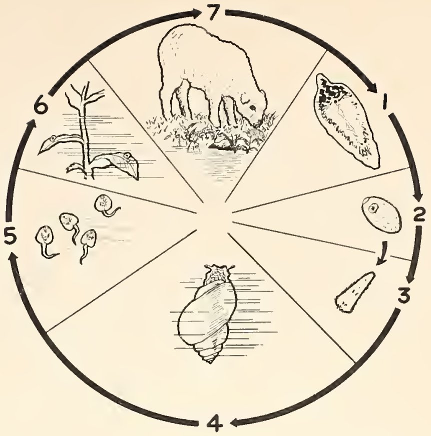
[1] The scientific name of the common liver fluke is *Fasciola hepatica*. At least three other species of liver flukes occur in the United States. They are the giant liver fluke (*Fasciola gigantica*), the large American fluke (*Fascioloides magna*), and the lancet fluke (*Dicrocoelium dendriticum*).

HOW THE FLUKE GROWS

The common liver fluke is a flat, brownish, leaf-shaped worm that has two suckers. At maturity, a fluke in a sheep usually reaches a length of about 1 inch.

In its complex life cycle—

- An adult fluke lays thousands of eggs in the bile ducts of sheep. These microscopic eggs pass out with the droppings. If an egg reaches water warmer than 50° F., it will hatch in 9 days to 6 weeks.
- A microscopic embryo emerges from the egg, gets into water, and swims about until it finds a fresh-water snail in which to live. If it does not find a suitable snail, it will die within 24 hours.
- The fluke cannot complete its life cycle unless it inhabits a suitable snail. When it finds one of these snails, the embryo fluke penetrates the soft parts of the snail's body. During its 4½ to 7 weeks in the snail, each embryo fluke produces several larvae.
- The milk-white larvae, which have flat, heart-shaped bodies and long tails, are just large enough to be visible to the unaided eye. When they escape from the snail, they swim about until they find grass, debris, or plants on which they settle.
- Larvae lose their tails and form minute whitish, pearl-like cysts. Usually, cysts become attached to grass, but occasionally they float on water. Sheep become infected with flukes when they eat grass or drink water containing cysts. Cysts can remain infective for several months, whether they are in or out of water.



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Life cycle of the common liver fluke. 1. Adult fluke. 2. Egg. 3. Embryo. 4. Development in snail. 5. Larvae. 6. Cysts. 7. Maturity in sheep's body. Eggs, embryos, larvae, and cysts seldom are seen without magnification.

- Immature flukes escape from the cysts, burrow through the walls of the intestine, and within 4 to 6 days migrate to the liver. They bore into the liver where they destroy tissue as they wander around. In 5 to 7 weeks, they enter the bile ducts. Here, they mature 2 to 3 months after they enter the body. Adult flukes begin a new life cycle by laying eggs. Some flukes live in the bile ducts of a sheep's liver and continue to lay eggs for as long as 11 years.

The life cycle of a fluke—from egg to egg—may require 4 to 6½ months, the time depending on the season and temperatures.

SYMPTOMS

If a sheep's liver is invaded by a large number of young flukes, the animal may die suddenly without showing any clinical symptoms.

A sheep with chronic infection loses condition and weight, tires

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A fluky sheep often loses condition and weight, appears dull and weak, and develops anemia.

easily, appears dull and weak, and goes off feed. As the animal develops anemia, its skin and mucous membranes lose color. Swellings known as bottle jaw or loop jaw may occur beneath the jaw, and potbelly may develop. Wool may become brittle and hard. The enfeebled sheep usually develops diarrhea at a late stage of infection. A fluky sheep may die at any time.

DIAGNOSIS

To find out if a flock of sheep is infected, ask your veterinarian, your State veterinary diagnostic laboratory, or a veterinary college or department to make a diagnosis. Usually, a sick animal suspected of harboring flukes is killed and its liver is carefully examined. Sometimes, feces of a live sheep are examined under a microscope for fluke eggs.

If flukes or eggs are found, begin control measures at once.

TREATMENT

Carbon tetrachloride destroys mature flukes in the bile ducts of a sheep's liver. Normally, this drug is safe for sheep, but occasionally, treated animals react violently. Another valuable drug is hexachloroethane, given as a drench.

Consult your veterinarian or officials of your State agricultural experiment station about treating sheep for flukes. They can advise you about methods that have proved most effective in your area.

When flukes are first diagnosed, treat all sheep in the flock at once.

In fluky areas, routinely treat sheep after the close of the grazing season in the fall; repeat treatment 1 month later. Give both treatments annually to all sheep over 3 months of age.

Carbon tetrachloride may be given in capsules or drench. Dosage is the same for both forms. At each treatment, give each adult sheep 2 cubic centimeters of carbon tetrachloride. Dose lambs with 1 cc. of the drug at each treatment.

Administer drenches with a drench syringe. Follow directions on the label of prepared drenches.

To minimize the possibilities of carbon tetrachloride poisoning—

- Give sheep plenty of water before treatment.
- Provide plenty of calcium in the diet for several weeks before treatment.
- Don't change feeds within 2 weeks before treatment.

After treatment, sheep usually recover condition and gradually lose symptoms of infection.

CONTROL

Destroying Snails

One way to control liver flukes is to kill their intermediate hosts—snails. When snails are destroyed, the life cycle is broken and flukes cannot mature to infect sheep or other animals.

The snails that act as intermediate hosts for flukes must have water or moisture to live. They burrow into soil during droughts and also overwinter in soil in northern areas. When they emerge during the first warm days following spring rains, snails are most vulnerable. Snails are readily killed by draining or filling wet pastures, or by using a chemical poison—copper sulfate—on pastures. Often, drainage and copper sulfate are used in separate areas of the same range to provide maximum kill of snails.

Drainage

Snails can be eradicated if the wet pastures that they inhabit are permanently drained. Treat undrained areas in other recommended ways.

Cut drainage ditches deep and wide enough to carry off all water. (If marshes, swamps, and wet spots on pastures are completely dried up, snails will not reappear.) Make banks perpendicular to ground level so that grass cannot grow on the sides of the ditches. Clean out ditches regularly to keep them

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Snails live in wet-weather springs (above, dried-up), slow-moving fresh water, mud, and marshes, or on banks of ponds and streams.

open; if the drainage system becomes clogged and does not remove water, marshy areas will form and snails probably will reappear.

Filling

Filling is a practical way to get rid of small, swampy areas. Use soil or other material to fill seepages and other wet spots in pastures.

Copper Sulfate

Copper sulfate usually will kill snails within 24 hours after it is applied to their habitat. When used as recommended, the chemical normally is not poisonous to man or livestock.

Copper sulfate does not affect cysts of liver flukes.

Bluestone and blue vitriol are common names for copper sulfate. It may be applied as a dust, as a spray, or as crystals. Because the chemical does not kill snail eggs, new generations of snails usually appear after treatment. For this reason, copper sulfate should be applied semiannually—or more often if large numbers of snails appear.

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Grass and water in low-lying, wet pastures often are infested with the tiny cysts that produce fluke infection in sheep.

Swampy areas.—Use copper sulfate to dust swampy or marshy spots, drainage ditches, spring overflows, seepages, margins of water, hog wallows, and large swampy areas not heavily overgrown. Apply the chemical with a hand or power duster if terrain permits. If large areas require treatment, airplane dusting may be practical.

Dust should contain copper sulfate powder and a carrier, such as kaolin (china clay), land plaster (gypsum), or sand. Prepare a dust in one of the following ways, and apply it at the rate indicated:

1. Kaolin as carrier—

Mix 1 part of chemical with 4 parts of kaolin.

Amount of chemical needed to treat 1 acre: 27½ pounds.

2. Land plaster as carrier—

Mix 1 part of chemical with 8 parts of land plaster.

Amount of chemical needed to treat 1 acre: 33¾ pounds.

3. Sand as carrier—

If sand is dry, mix 1 part of chemical with 4 parts of sand; if sand is wet, mix 1 part of chemical with 8 parts of sand.

Amount of chemical needed to treat 1 acre: If sand is dry, 20 pounds; if sand is wet, 27½ pounds.

Wet pastures.—On wet pastures with heavy vegetation, kill snails with a spray containing 0.5 percent of copper sulfate. Prepare the spray by dissolving 1 pound of copper sulfate crystals in a small amount of warm water. Add this to each

25 gallons of water and mix thoroughly. Adjust the sprayer to dispense 137 gallons of solution per acre.

STREAMS.—Streams that flow over snail-infested lands may be treated by placing a burlap bag containing large crystals of copper sulfate in headwaters, at dams, or at a high, narrow part of the water course. Use 12 pounds of copper sulfate for each cubic foot per second of flow.

To determine the amount of copper sulfate needed to treat a stream:

1. Find the rate of flow of water in cubic feet per second. To do this, select a uniform section of the stream and mark off 50 feet. Measure the width and average depth of flowing water in this section. Multiply these figures to obtain the area of the cross section in square feet.

Example

Width of stream: 6 feet.
Average depth: 6 inches (½ foot).
6×½=3 square feet.

Float a chip over the marked section and time its progress to obtain the speed in feet per second.

Example

The chip floats 50 feet in 25 seconds.
50÷25=2 feet (rate of flow per second).

Multiply the area of the cross section by the speed of the water. The product is the approximate flow of the stream in cubic feet per second.

Example

3×2=6 cubic feet per second.

2. To get the total amount of copper sulfate needed, multiply the flow in cubic feet per second by 12 pounds, the amount needed for each cubic foot per second of flow.

Example

6×12=72 pounds of copper sulfate
(amount needed to treat stream).

PONDS.—For snail-infested ponds, place large crystals directly in the water. Normally, ponds are treated at the rate of 1 part of copper sulfate to 500,000 parts of water. If the water or area is heavily infested with snails, treat at the rate of 1 part of chemical to 250,000 parts of water. For a 1:500,000 dilution, use 5½ pounds of copper sulfate per acre-foot; for a 1:250,000 dilution, use 11 pounds of copper sulfate per acre-foot.

To obtain acre-feet, multiply the estimated surface area of water in acres by the average depth of water in feet.

CAUTION

Copper sulfate used improperly can kill fish and water plants. In treating water stocked with fish, place copper sulfate close to banks.

Although the chemical usually is safe when used at recommended concentrations, sheep may be poisoned if they are exposed to repeated spraying or dusting.

Fencing Infested Areas

If known fluke-infested areas are not drained or treated with copper sulfate, fence livestock out. Place fences far enough back from these fluke-infested areas to prevent sheep from eating infested grass or drinking infested water.

Good Management

Follow sound management practices to prevent sheep from eating grass or drinking water containing cysts.

Do not feed sheep forages that have been cut from fluke-infested lands. Animals in feedlots may become infected with flukes after eating forages on which cysts have remained for several months.

Control wild rabbits wherever practical. Flukes develop in rabbits in the same way they develop in sheep and cattle. Feces from fluky rabbits contain eggs that can hatch new generations of flukes.

Know fluky areas of your ranges and pastures. Watch for temporary pools and wet spots where snails collect. These areas are most likely to contain fluke cysts. After heavy rains, keep animals out of these areas for several weeks, if possible.

BLACK DISEASE

An acute infection known as black disease develops in some fluky sheep. This disease is caused by a bacterium [2] usually present but dormant in normal sheep livers. When liver tissues are severely damaged, the bacteria become active and form a death-producing poison. There is no treatment or cure.

Black disease may be confused with anthrax, because both run rapid courses. Often, animals are found dead without showing signs of illness. A sheep with black disease may be sluggish and lag behind the flock. Later, its breathing becomes rapid and it develops fever.

The carcass of a sheep dead of black disease appears purplish-black. It gives off a peculiar, but not unpleasant, odor.

A vaccine that will prevent black disease in sheep can be given by a veterinarian. When a lamb is vaccinated just after weaning, it is protected for life.

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[2] *Clostridium novyi.*

PROTECT

Use Pesticides Safely

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U.S. DEPARTMENT OF AGRICULTURE

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